

ECOSYSTEM STATUS INDICATORS

Marine Mammals

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PINNIPEDS

Steller sea lion (*Eumetopias jubatus*)

In November 1990, the NMFS listed Steller sea lions as “threatened” range-wide under the U.S. Endangered Species Act (55 Federal Register 49204, November 26, 1990) in response to a population decrease of 50% - 60% during the previous 10 – 15-year period. Several years later, two population stocks were identified, based largely on differences in genetic identity, but also on regional differences in morphology and population trends (Bickham et al. 1996, Loughlin 1997). The Western Stock, which occurs from 144°W long. (approximately at Cape Suckling, just east of Prince William Sound, Alaska) westward to Russia and Japan, was listed as “endangered” in June 1997 (62 Federal Register 24345, May 5, 1997). The Eastern Stock, which occurs from Southeast Alaska southward to California, remains classified as threatened. Population assessment for Steller sea lions is currently achieved by aerial surveys of non-pups and on-land pup counts.

An aerial survey of the endangered Western Stock of Steller sea lions in Alaska (from Cape St. Elias, 144°W to Attu Island, 172°E) was conducted by NMFS in June 2004. This was the first complete survey conducted using medium format, vertical photogrammetric techniques. In previous years, counts of adult and juvenile (non-pup) sea lions were made from 35 mm slides shot obliquely (from the side windows) of aircraft. Based on comparison surveys, counts made from medium format photographs are approximately 3-4% higher than those from 35 mm slides because of the resolution of the film and the orientation of the photograph.

In 2004, there were a total of 28,730 non-pup Steller sea lions counted on the 262 sites surveyed in the range of the western stock. NMFS monitors the population at a series of ‘trend’ sites that have been consistently surveyed since the mid-1980s. The 2002 counts were made from 35 mm slides as opposed to the medium format photographic technique first used in 2004. Subtracting the 3-4% increase due to film format differences, NMFS estimates that the western Steller sea lion population increased approximately 6-7% from 2002 to 2004. This is similar to the rate of increase observed between 2000 and 2002 when standard 35mm slide techniques were used (Figure 91).

There were regional differences in the trends observed between 2002 and 2004. Trend site counts increased between 2002 and 2004 in the three Aleutian Islands sub-areas (Western, Central and Eastern) and in the western Gulf of Alaska, from the Shumagin Islands through Unimak Pass (Figures 91 and 92). However, in the eastern portion of the range of the western Steller sea lion population, trend site counts remained stable (near Prince William Sound in the eastern Gulf of Alaska) or decreased (around Kodiak Island in the central Gulf of Alaska).

A slightly different pattern of trends is revealed when a longer time series of sub-area counts since 1989 are examined (Table 19). Steller sea lion non-pup counts in the center of the range of the western stock (the western Gulf of Alaska and Eastern Aleutian Islands from the Shumagin Islands through the Islands of Four Mountains) remained relatively stable from 1989-2004, showing oscillations around a mean. To the west, sea lion numbers decreased through the mid-1990s in both the Central and Western Aleutian

Islands. Trend site counts stabilized at the 1998 level in the Central Aleutians, but continued to decline in the Western Aleutians through 2002 followed by a small increase between 2002 and 2004. To the east, trend site counts decreased sharply in both the Central and Eastern Gulf of Alaska through 1998. Since then, counts increased in the Eastern Gulf of Alaska, but continued to decline, at a slower rate, in the Central Gulf of Alaska. NMFS, along with its research partners in the North Pacific, is exploring several hypotheses to explain these trends, including climate or fisheries related changes in prey quality or quantity, and increases in the rate of predation by killer whales.

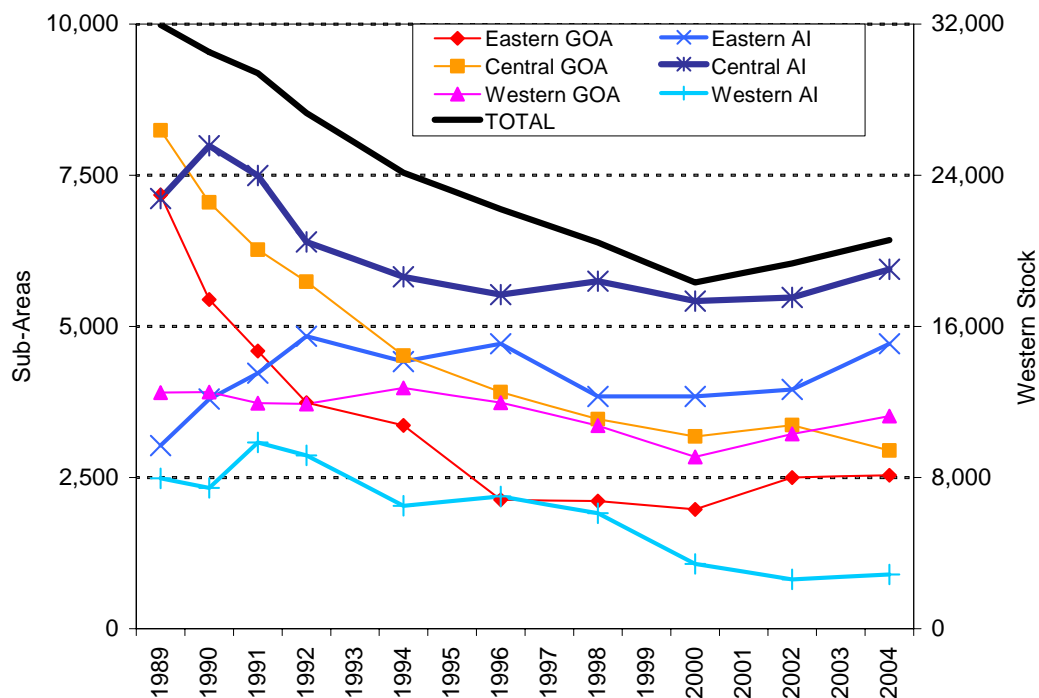


Figure 91. Counts of non-pup (adult and juvenile) Steller sea lions on rookery and haulout trend sites in the range of the western population from 1989-2004. Counts are aggregated by sub-area (left axis) in the Gulf of Alaska (GOA) and Aleutian Islands (AI) and for the entire western Alaskan population (TOTAL; right axis). Surveys in 1989-2002 used 35 mm oblique slides, while the 2004 survey used medium format vertical photographs. Counts in 2004 displayed above have been reduced 3.5% from the actual count to account for the format differences (see text).

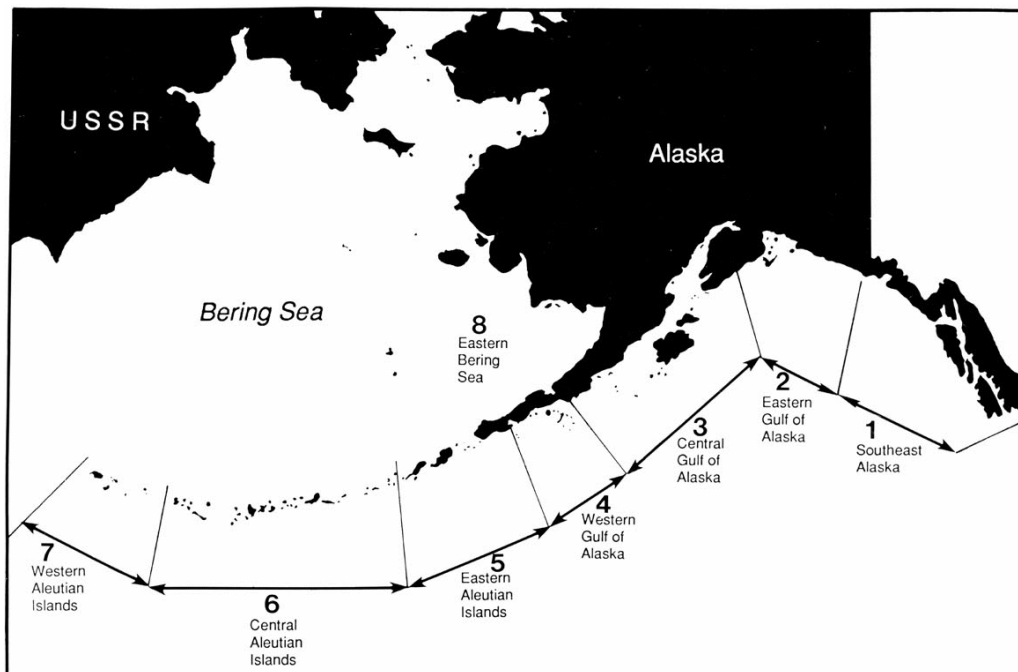


Figure 92. Map of Alaska showing areas within the range of the western Steller sea lion (subareas 2-7) surveyed in 2004.

Table 19. Counts of adult and juvenile (non-pup) Steller sea lions observed at rookery and haulout trend sites in six subareas of Alaska during June and July aerial surveys from 1989 to 2004, including overall percentage changes between 2002 and 2004, 2000 and 2002, and 1991 and 2004, and estimated annual rates of change from 1991-2004. Counts in 1989-2002 were made visually or from 35 mm slides shot obliquely out the side windows of aircraft. Counts in 2004 were made from medium format photographs shot vertically over rookery and haulout sites. Comparison studies suggest that counts from medium format photographs are approximately 3-4% greater than from 35 mm photographs. Both the corrected (2004¹) and uncorrected (2004²) subarea trend site counts in 2004 are listed. Corrected 2004 counts were used to compute percentage changes and annual rates of change.

Year	Gulf of Alaska			Aleutian Islands			Western Stock
	Eastern	Central	Western	Eastern	Central	Western	
1989	7,175	8,243	3,908	3,032	7,114	2,486	31,958
1990	5,444	7,050	3,915	3,801	7,988	2,327	30,525
1991	4,596	6,270	3,732	4,228	7,496	3,083	29,405
1992	3,738	5,739	3,716	4,839	6,398	2,869	27,299
1994	3,365	4,516	3,981	4,419	5,820	2,035	24,136
1996	2,132	3,913	3,739	4,715	5,524	2,187	22,210
1998	2,110	3,467	3,360	3,841	5,749	1,911	20,438
2000	1,975	3,180	2,840	3,840	5,419	1,071	18,325
2002	2,500	3,366	3,221	3,956	5,480	817	19,340
2004 ¹	2,540	2,948	3,517	4,714	5,944	899	20,563
2004 ²	2,632	3,055	3,645	4,885	6,160	932	21,309
Percentage Changes							
2002-2004	1.6%	-12.4%	9.2%	19.2%	8.5%	10.1%	6.3%
2000-2002	26.6%	5.9%	13.4%	3.0%	1.1%	-23.7%	5.5%
1991-2004	-44.7%	-53.0%	-5.7%	11.5%	-20.7%	-70.8%	-30.1%
Annual Rates of Change 1991-2004							
Annual Change	-4.7%	-5.6%	-1.4%	-0.6%	-1.5%	-10.6%	-3.1%
Upper 95%	-0.2%	-3.7%	0.4%	1.4%	0.2%	-7.3%	-1.5%
Lower 95%	-9.2%	-7.5%	-3.2%	-2.5%	-3.2%	-13.8%	-4.8%
P ³	0.0446	0.0004	0.1032	0.4993	0.0752	0.0002	0.0037

¹2004 subarea and western stock counts made from medium format film; reduced by 3.5% to account for format differences. These data were used to calculate percentage changes and annual rates of change.

²2004 subarea and western stock counts made from medium format film; uncorrected for format differences.

³Bold indicates P<0.10 (estimated annual rate of change significantly different from 0).

Northern fur seal (*Callorhinus ursinus*)

The northern fur seal ranges throughout the North Pacific Ocean from southern California north to the Bering Sea and west to the Okhotsk Sea and Honshu Island, Japan. Breeding is restricted to only a few sites (i.e., the Commander and Pribilof Islands, Bogoslof Island, and the Channel Islands) (NMFS 1993). During the breeding season, approximately 74% of the worldwide population is found on the Pribilof Islands in the Bering Sea (NMFS 1993). Two separate stocks of northern fur seals are recognized within U.S. waters: an Eastern Pacific stock and a San Miguel Island stock.

Northern fur seals were listed as depleted under the MMPA in 1988 because population levels had declined to less than 50% of levels observed in the late 1950s, with no compelling evidence that carrying capacity had changed (NMFS 1993). Fisheries regulations were implemented in 1994 (50 CFR 679.22(a) (6)) to create a Pribilof Islands Area Habitat Conservation Zone, in part, to protect the northern fur seals. Under the MMPA, this stock remains listed as "depleted" until population levels reach at least the lower limit of its optimum sustainable population (estimated at 60% of carrying capacity). A Conservation Plan for the northern fur seal was written to delineate reasonable actions to protect the species (NMFS 1993). The population size and trends of northern fur seals on the Pribilof Islands are estimated by NMFS biennially using a mark-recapture method (shear-sampling) on pups of the year.

Based on counts conducted during August 2004, it is estimated that 122,803 (SE = 1,290) pups were born on St. Paul Island and 16,876 (SE = 239) pups were born on St. George Island (Tables 20 and 21). The observed pup mortality rates of 3.27% on St. Paul Island and 2.46% on St. George Island were relatively low, and similar to estimates obtained in 2002. The 2004 pup production estimate for St. Paul Island is 15.7% less than the estimate in 2002 and 22.7% less than the estimate in 2000. The 2004 pup production estimate for St. George Island is 4.1% less than the estimate in 2002 and 16.4% less than the estimate in 2000. Estimated pup production has declined at 6.4% per year (SE = 0.78%, $P = 0.01$) on St. Paul Island, and at 4.6% per year (SE = 0.45%, $P = 0.01$) on St. George Island, from the estimated pup production in 1998 (Figure 93). Estimated pup production on the two islands, as a whole, has declined at 6.2% per year (SE = 0.58%, $P = 0.01$) since 1998. The 2004 pup production estimate on St. Paul Island is comparable with the level observed in 1918, while the St. George pup production estimate is below the level observed in 1916. During the time period of 1916 to 1918, the northern fur seal population was increasing at approximately 8% per year following the cessation of extensive pelagic sealing.

Table 20. Numbers of northern fur seal, *Callorhinus ursinus*, pups born on St. Paul Island, Alaska in 2004. Estimates are shown on numbers alive at the time of shearing, counts of dead pups, estimates of pups born, standard error of estimate (SE), and estimates of pup mortality rate (%).

Rookery	Live	Dead	Born	SE	Mortality
Lukanin	2,993	102	3,095	176.0	3.30
Kitovi	4,800	109	4,909	48.5	2.22
Reef	15,262	456	15,718	492.5	2.90
Gorbatch	9,569	417	9,986	96.0	4.18
Ardiguen	1,158	38	1,196	104.0	3.18
Morjovi	8,781	217	8,998	177.0	2.41
Vostochni	18,872	618	19,490	436.5	3.17
Polovina	2,511	70	2,581	108.0	2.71
Little Polovina ¹	67	2	69	4.9	2.90
Polovina Cliffs	10,889	177	11,066	503.0	1.60
Tolstoi	13,146	639	13,785	560.5	4.64
Zapadni Reef	4,916	171	5,087	245.5	3.36
Little Zapadni	10,021	418	10,439	204.0	4.00
Zapadni	15,799	585	16,384	682.0	3.57
Total	118,784	4,019	122,803	1,289.8	3.27

¹ Live and dead pups for Little Polovina were estimated to reduce disturbance to this diminishing rookery.

Table 21. Numbers of northern fur seal, *Callorhinus ursinus*, pups born on St. George Island, Alaska in 2004. Estimates are shown on numbers alive at the time of shearing, counts of dead pups, estimates of pups born, standard error of estimate (SE), and estimates of pup mortality rate (%).

Rookery	Live	Dead	Born	SE	Mortality
South	3,774	134	3,908	70.0	3.43
North	5,299	96	5,395	25.0	1.78
East Reef	915	20	935	55.0	2.14
East Cliffs	3,305	72	3,377	52.0	2.13
Staraya Artil	974	27	1,001	132.0	2.70
Zapadni	2,194	66	2,260	168.5	2.92
Total	16,461	415	16,876	238.9	2.46

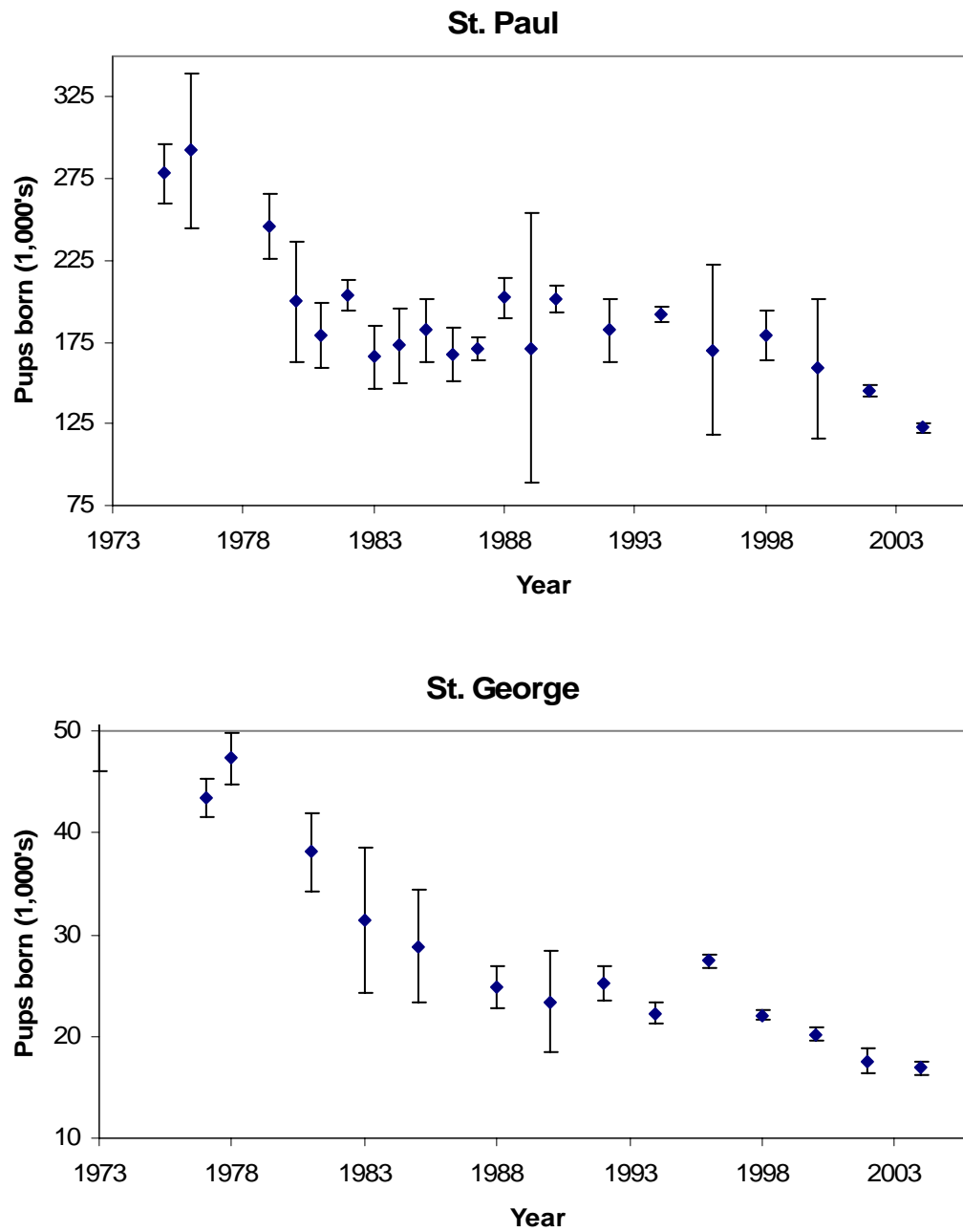


Figure 93. Northern fur seal pups born on the Pribilof Islands 1975-2004. Error bars are approximate 95% confidence intervals.

Harbor Seal (*Phoca vitulina*)

Harbor seals inhabit coastal and estuarine waters off Baja California, north along the coastline to Alaska, including the Aleutian Islands and Bering Sea north to Cape Newenham and the Pribilof Islands. They haul out on rocks, reefs, beaches, and drifting glacial ice, and feed in marine, estuarine and occasionally fresh waters. Harbor seals are generally non-migratory (Scheffer and Slipp 1944, Frost et al. 1996). Population counts of harbor seals are conducted by aerial survey, but statistical treatments are undergoing substantial changes to account for environmental covariates that affect haulout, and therefore the likelihood that seals will be counted in the surveys. Based primarily on the significant population decline of seals in the Gulf of Alaska, the possible decline in the Bering Sea, and the stable population in southeast Alaska, three separate stocks have been recognized in Alaskan waters: 1) Southeast Alaska stock - occurring from the Alaska/ British Columbia border to Cape Suckling, Alaska (144°W); 2) the Gulf of Alaska Stock - occurring from Cape Suckling to Unimak Pass including animals throughout the Aleutian Islands, and 3) the Bering Sea Stock - including all waters north of Unimak Pass. Initial results of new genetic information indicate that the current boundaries between the three stocks need to be reassessed. Updated population estimates will be available after redefinition of stock boundaries (Angliss and Lodge 2004).

Statewide abundance

The National Marine Mammal Laboratory (Alaska Fisheries Science Center) conducted aerial surveys of harbor seals across the entire range of harbor seals in Alaska. Each of five survey regions was surveyed between 1996 - 2000, with one region surveyed per year (Boveng et al. 2003; Simpkins et al. 2003). The current statewide population estimate for Alaskan harbor seals is 180,017 (Table 22). This estimate, however, is believed to be low because it is based on incomplete coverage of terrestrial sites in Prince William Sound and of glacial sites in the Gulf of Alaska and the Southeast Alaska regions.

Table 22. Provisional regional and statewide population estimates for Alaskan harbor seals (subject to revision as part of analyses that are currently underway).

Survey Region	Survey Year	Updated population estimate	Abundance estimate included in 1998 SARs
SE Alaska, southern part	1998	79,937 (CV?)	37,450 (0.073) Based on 1993 surveys
SE Alaska, northern part	1997	32,454 (CV?)	
Gulf of Alaska	1996	35,982 (CV?)	29,175 (0.052) Based on a 1994 count for the Aleutians and a 1996 survey for the Gulf of Alaska
Aleutians	1999	9,993 (CV?)	
Bristol Bay (Bering Sea stock)	2000	21,651 (CV?)	13,110 (0.062) Based on 1995 surveys
Total		180,017 (CV?)	

Southeast Alaska Stock Abundance

Information on trends in abundance is available for harbor seal trend sites near Ketchikan, Sitka, and in Glacier Bay. Based on counts near Ketchikan between 1983 and 1998, abundance has increased 7.4% (95% CI: 6.1-8.7; significant; Small et al. 2003). Counts near Sitka failed to show a significant trend

either between 1984-2001 or 1995-01 (Small et al. 2003). Information from Glacier Bay indicates a sharp overall decline of 25-48% in harbor seal abundance from 1992-98 (Mathews and Pendleton 2000).

Gulf of Alaska Stock Abundance

There are trend counts available from two areas inhabited by the Gulf of Alaska stock of harbor seals: Kodiak and Prince William Sound. Trend counts from Kodiak documented a significant increase of 6.6%/year (95% CI: 5.3-8.0; Small et al. 2003) over the period 1993-01, which was the first documented increase in harbor seals in the Gulf of Alaska. Harbor seals on Tugidak Island (SW of Kodiak) had declined 21%/year from 1976-78, and 7%/year from 1978-98 (Pitcher 1990). Frost et al. (1999) reported a 63% decrease in Prince William Sound from 1984-97; more recent information on trends in this area is not available.

Bering Sea Stock Abundance

Trend counts have been conducted in Bristol Bay only between 1998-01. During this period, counts indicated a non-significant trend of -1.3% (95% CI: -5.9-3.3; Small et al. 2003). Calculation of trends in abundance in this area is somewhat problematic due to the presence of a sympatric species, spotted seals, which may overlap the range of harbor seals but cannot be identified as a different species by aerial surveys.